

CHILD/INFANT PLAY AND ENTERTAINMENT DEVICES INCLUDING ELECTRONIC DISPLAYS**BACKGROUND OF THE INVENTION**5 1. Field of the Invention

The present invention relates generally to child/infant play and entertainment items and more specifically to child and infant play and entertainment devices including one or more electronic displays.

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2. Background of the Invention

Technological innovation associated with electronics and electronic displays has proceeded more slowly in baby and child play and entertainment devices than in other product areas. In 15 part, the slower progress has been due to the additional cost of the electronics and electronic displays, but safety considerations have also been a factor. Electronic displays (such as liquid crystal displays (LCDs) typically require a hard case for protection, and include glass and plastic elements that 20 can be dangerous to a child or infant when shattered. Therefore, due to cost and safety considerations, toys which emulate display-based electronic equipment do not include actual displays, but rather include depictions of displays in locations where those displays would normally be included.

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In the recent past, electronic display technology has improved to yield increasingly low-cost, low power and flexible graphical and textual displays, such as organic light-emitting diode (OLED) displays. Typically developed for use in electronic books and electronic paper applications, the structure and flexibility of such displays provides an alternative to a hard-cased and rigid LCD display. Also, for some applications, the falling cost of both rigid and flexible displays make them increasingly desirable in applications for infants and children.

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Therefore, it would be desirable to provide child/infant play and entertainment devices that incorporate flexible displays to provide safety and novel applications for displays in child/infant play and entertainment devices. It would further be desirable to provide child/infant play and entertainment devices that incorporate rigid or flexible displays to novel applications where flexibility is not a requirement.

SUMMARY OF THE INVENTION

The above objectives of providing child/infant play and entertainment devices are accomplished in a variety of devices that incorporate electronic displays. Flexible displays are 5 incorporated in baby toys and other infant devices where safety and/or structure dictates that no hard surfaces, sharp corners and/or breakable parts are present. Flexible or rigid displays are incorporated in other child entertainment devices that do not require the use of flexible displays for safety. The devices 10 may be battery operated when desirable for portability or convenience and a wireless or wired interface to a remote programming device such as an Internet-connected computer may be provided for changing the appearance and features of a device. Sound features may also be incorporated in synchrony with the 15 visual display for further enhancing the play or entertainment experience.

The foregoing and other objectives, features, and advantages of the invention will be apparent from the following, 20 more particular, description of the preferred embodiment of the invention, as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figures 1 to 18 are pictorial diagrams depicting infant/child play and entertainment devices in accordance with embodiments of the present invention.

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Figure 19 is a block diagram depicting an electronic system for operating the displays incorporated within the devices of **Figures 1 to 18** in accordance with embodiments of the present invention.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention provides various interactive and display improvements to children's and infant's play and entertainment devices. The improvements include multipixel 5 graphic displays integrated within a toy or other device body as depicted in the figures. The multipixel graphic displays are indicated in the drawings by the reference numeral **10A-X** which differ by shape and size and may include multiple displays as indicated, but will generally be organic light-emitting diode 10 (OLED) displays in applications for infants, where flexibility and lack of breakable parts is required or desirable. The graphic displays are used to display static images, including photographs, which may be digital or digitized photographs of familiar images (e.g., the child/infant or parent's face). The 15 graphic displays may also be used to display animated figures, or static or animated colors or patterns.

In other applications where flexibility is not required, an 20 OLED may be employed or another display type such as a liquid crystal display (LCD) may alternatively be used. Sound, supplied by a transducer incorporated within the toy or other device body can be synchronized with the programming of the display to further enhance the entertainment or play experience. The electronics for driving and programming the display can be

located within the device, where permitted, as can a battery power supply. Alternatively, for applications where the device does not have to be self-contained, the electronics may be located remotely and the power supply may alternatively be a 5 wall power supply or other suitable power source.

Figures 1-18, along with the descriptions of the figures supplied below, provide illustrative embodiments of the present invention that should be considered exemplary, but not limiting 10 of the present invention.

Referring now to **Figure 1**, such a display-incorporating device is depicted, comprising a thin flexible sheet incorporating a display **10A** for use on a floor as a play mat, or 15 which may be hung on a wall, car seat, crib, changing table, play pen, high chair, car seat or other location for providing attractive displays to infants. **Figures 2-4** depict embodiments of a mobile or other device for suspension above an infant in a crib. **Figure 2** is a display suspended by an arm **11** for locating 20 a display over a crib. The display may be a curved (convex or concave surface) or may be flat. **Figure 3** is a mobile incorporating displays **10C** hanging from suspension arms **12** and cut in various shapes. The shapes can change patterns or colors by virtue of programming displays **10C** with varying patterns and

colors. **Figure 4** is another mobile incorporating shape-cut displays **10C** and further incorporating a center display **10D** similar to the display of **Figure 2**. While the "shape-cut" displays are produced with cut figures for the display packaging 5 (generally a plastic laminate enclosing OLED elements), the circuit patterns interconnecting the display elements are designed so as to avoid the cutting lines. Suspension arms **12A** may also be made with wrap-around display material, so that the entire structure of the mobile of **Figure 4** can be made to change 10 as displays **10C**, **10D** and arms **12A** are reprogrammed to take on varying patterns and colors.

Figure 5 depicts a child's or infant's plush toy, such as the teddy bear depicted, incorporating a flexible display **10E** on 15 the surface. A display may be incorporated on any surface or an entire toy may be made of a flexible display. Switches or sensors may be incorporated within the toy to detect pressure on the toy's surfaces, sound or motion of the toy, so that programming of display **10E**, as well as sound, if incorporated, 20 may be made responsive to touch or motion of the toy.

Figure 6 depicts a child's entertainment device provided by displays **10F** and/or **10G** attached to a stroller. Display **10F** is a wrap-around display for attachment to a stroller bar **14**, which

includes an attachment feature such as VELCRO strips for securing display **10F** to stroller bar **14**, snaps or other suitable attachment arrangement. Wrap-around display **10F** can also be used in other child/infant devices that have bars, such as hi-chairs, 5 baby carriers and car seats. Display **10G** is a flat-panel display attached to the stroller body (or stroller bar **14**) via a clamping arrangement or other suitable attachment, whereby display **10G** is presented for viewing by a child or infant.

Figure 7 similarly depicts a child or infant's car seat 10 including flat-panel display **10G**, wrap-around display **10F** (this time attached to a car seat bar **14A**) and shape-cut displays **10C** as included in the above-described mobiles of **Figures 3** and **4**.

Figure 8 depicts the use of a flexible display for 15 entertaining a child or infant while in an automobile. Display **10H**, provided in a thin, flexible package similar to the playmat/screen of **Figure 1**, can be positioned over the back of the front seat of the automobile and either draped for holding by the weight of the device or attached with straps, loop 20 fasteners (such as VELCRO) or other suitable means. Display **10H** can also be positioned for infants in rear-facing car seats as shown toward the rear of the figure.

Figure 9 depicts an exemplary display **10J** programming scheme for a child. While programming screens for infants will include images and colors (such as the animals depicted in some of the figures), display **10J** is programmed with smaller images 5 including letters, images of shapes, animals, etc. for use in puzzles, tests and games for challenging children, providing an educational as well as an entertainment function. A touchscreen may be incorporated in any of the displays for interaction with the shapes and solving puzzles, taking tests and playing games.

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Figure 10 depicts a flexible display **10K** affixed to a crib for holding an infant or small child. Display **10K** provides entertainment and stimulus via programming. Straps **16** (such as VELCRO straps) or another attachment device are provided for 15 affixing display **10K** to the crib bars. (Alternatively, attachment points may be provided on the crib via snap or other fasteners and display **10K** may be attached to other points on the crib). Also shown is the use of mobile **10C** as described above in conjunction with display **10K**.

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Figure 11 depicts a shaped object for play by an infant and incorporating a display **10L** on a face thereof. **Figure 12** is illustrative of another shaped play object having displays **10M** incorporated on multiple faces. **Figure 13** depicts a ball having

displays **10N** incorporated on sections approximating the spherical surface of the ball. All of the above described play items will generally incorporate flexible displays, but may also be made incorporating more rigid displays and structures where 5 the play items are intended for use by older children, and safety does not dictate the use of flexible displays.

Figures 14-17 depict play devices that emulate actual items used by adults or other children. **Figure 14** depicts a well-known 10 toy shape referred to as a "popper" that emulates a cleaning device in child play. A display **10P** is incorporated that can be programmed to display colors and shapes, or even balls moving within a clear plastic tube (as the original toy employed) providing a visually stimulating display. **Figure 15** depicts a 15 play desk including display device **10R** incorporated conformal to the top surface, display **10Q** angled above the top surface and display **10S** incorporated on an object on the surface. **Figure 16A** depicts a toy car of a type that may be entered or propelled by a child and alternatively a child's play car of a smaller size. 20 Displays **10T** provide a road-view and dashboard control view, which may be separate displays, to enhance the car-play experience. **Figure 17** is exemplary of a toy mobile telephone that incorporates a display **10U** that may be programmed to provide non-standard display (such as flashing colors) for an

infant, or more typical mobile phone type of display for an older child. Each of the above-described play devices of **Figures 14-17** can be made of a flexible soft material (such as open-cell foam) and include flexible displays making them suitable for use 5 by infants.

Figure 18 is an illustration of a baby carrier in accordance incorporating shape-cut displays **10C** as described for the mobiles of **Figures 3 and 4**, as well as the car carrier of 10 **Figure 7** and the crib of **Figure 10**.

Referring now to **Figure 19**, driver circuits **30** suitable for use within the above-described devices are shown in a block diagram. Displays **31** and **31A** (to illustrate multiple displays 15 not limited to two) which are affixed to the body of a child's or infant's play or entertainment device, are coupled to a set of matrix drivers **32**. Displays **31** and **31A** may each comprise a further plurality of electronic displays all connected to matrix driver **32** and may be individually selectable via matrix drivers 20 **32**. Matrix drivers **32** are coupled to processor **33** for receiving information corresponding to text, graphics and colors displayed on display **31** and processor **33** is coupled to a memory **34** for storing program instructions for execution by processor **33** and data corresponding to graphical images, text and colors for

display on display **31**. A sound subsystem **41** is coupled to processor **33** for providing audio to further enhance the play or entertainment experience.

5 A wireless network node **39A**, which may be an Internet node, is coupled to processor **33** to provide receipt of wireless communications and information from a wireless remote programming device **40**, such as images, sound and graphics as well as parent (or other child) interactivity via controls or
10 remote programming device **40** or via a computer connected via the Internet or direct connection to remote programming device **40**. Remote programming device can be connected via a wireless interface as described above, or detachably coupled through a connector **35A** directly to a hardwired programming interface **35**.
15 Alternatively, cartridges may be provided and inserted in connector **35A** for loading data from the cartridges into the device.

 Sensor/switch input interface **36** is coupled to processor **33** and may be coupled to sensors (such as motion sensors, touch sensors and sound sensors), switches or buttons mounted on the play device or display. Sensor/switch input interface **36** also couples any provided touch-screens integrated with displays **31** and **31A**. Power for displays **31** and driver circuit **30** may be

provided by a battery, and solar cells or kinetic electrical devices may be used to either re-charge the battery, or may be used in some embodiments for providing all of the power source. Alternatively, for some play devices a wall AC or DC power supply may be used or a full line power supply incorporated within the device body, as long as safety requirements are met.

While the invention has been particularly shown and described with reference to the preferred embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes in form, and details may be made therein without departing from the spirit and scope of the invention.